

**U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT
OFFICE OF QUALITY ASSURANCE**

AUDIT REPORT M&O-ARP-98-20

OF THE

**CIVILIAN RADIOACTIVE WASTE MANAGEMENT SYSTEM
MANAGEMENT AND OPERATING CONTRACTOR**

AND THE

U.S. GEOLOGICAL SURVEY

AT

LAS VEGAS, NEVADA

SEPTEMBER 28 THROUGH OCTOBER 7, 1998

Prepared by: _____ Date: _____

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Approved by: _____ Date: _____

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1.0 EXECUTIVE SUMMARY

This performance-based Quality Assurance (QA) audit was conducted, as a follow-up to Audit M&O-ARP-98-16, at the Civilian Radioactive Waste Management System Management and Operating Contractor (CRWMS M&O) Offices, Las Vegas, Nevada, September 28 through October 7, 1998. The audit had two purposes. The first was to further evaluate the Technical Data Management System (TDMS) relative to the concerns of timeliness of the submittal of data and data traceability. The audit team determined that the CRWMS M&O has effectively implemented critical process steps relative to the development and accessing of the TDMS except for the areas identified as deficient in the previous audit (i.e., procedural controls for the Site and Engineering Properties [SEP]). The concerns with the timeliness of submittal of data to the TDMS, and the submittal of past data to the TDMS were evaluated during this audit, resulting in recommendations identified in Section 6.0. The second purpose was to conduct an evaluation of the submittal, verification and use of technical data developed for the Yucca Mountain Site Characterization Project (YMP). A significant condition adverse to quality was discovered when reviews of selected Technical Reports disclosed that some data referenced in the reports were not traceable to its origin, that the data referenced could not always be traced to its qualification status, and that, overall, the identification and traceability of data was not being maintained due to an inadequate preparation and review process.

Corrective Action Request (CAR) LVMO-99-C-001 was issued to identify that, due to a lack of rigor by the originating organization(s) in the report preparation and subsequent technical reviews, the Technical Reports supporting the Office of Civilian Radioactive Waste Management (OCRWM) Viability Assessment (VA) were not accurate. Specifically, traceability of data used or referenced in Technical Reports to the data source(s) is not maintained. Details of these deficient conditions adverse to quality are presented in Section 5.5.1 of this report. Also as a result of the audit, seven recommendations are provided. These recommendations are detailed in Section 6.0 of this report.

2.0 SCOPE

The audit was conducted to further evaluate the TDMS relative to the previous audit concerns of timeliness of the submittal of data and to the concerns of data traceability. It was also conducted to evaluate the submittal, verification and use of technical data developed for the YMP.

The previous audit (M&O-ARP-98-16) utilized the following references that resulted in concerns and issues requiring this follow-up audit. These references were also used to evaluate/validate the unresolved issues from the previous audit.

- SP24BM3, *The Site Scale Unsaturated Zone Model of Yucca Mountain, Nevada, for the Viability Assessment, dated June 1997* (Lawrence Berkeley National Laboratory

[LBNL])

- SP25BM3, *The Site-Scale Unsaturated Zone Transport Model of Yucca Mountain, Revision 1* (Los Alamos National Laboratory [LANL])
- SP3000M3, *Near-Field and Altered-Zone Environment Report, Volume 1: Technical Basis for EBS Design, Revision 1* (Lawrence Livermore National Laboratory [LLNL])

Additional data was also evaluated from the following reports/deliverables selected during the audit:

- SPY148M4, *Single Heater Test Final Report*, (Sandia National Laboratories [SNL])
- SLX0M3, *TSPA-VA Technical Basis Document, Unsaturated Zone Hydrology Model*, (SNL)
- SPG32M3, *Administrative Report: Integrated Fracture Data in Support of Process Models, Yucca Mountain, Nevada*, (United States Geological Survey [USGS])
- SP23PM3, *Results of Hydraulic and Conservative Tracer Tests in Miocene Tuffaceous Rocks at the C-Hole Complex, 1995 to 1997, Yucca Mountain, Nye County, Nevada*, (USGS)
- SP24CBM3, *Preliminary Saturated-Zone Flow Model*, (USGS)
- Special Studies, *The Technical Site Suitability Synthesis Report (Site Description Document)*, Section 4, CRWMS M&O

The audit team conducted personnel interviews and reviews of documentation in accordance with the approved audit plan to evaluate the adequacy and effectiveness of critical process steps for TDMS and use of data activities.

2.1 Process Steps/Products/Documentation

The performance-based evaluation of process effectiveness was based upon the following:

1. Satisfactory completion of critical process steps;
2. Documentation that substantiates the quality of data;
3. Performance of trained and qualified personnel; and
4. Implementation of applicable QA program elements.

The following critical process steps were considered during the follow-up evaluations of the TDMS processes and use of data activities:

- Data submittal and receipt
- Data traceability
- Data input into Geographic Nodal Information Study and Evaluation System (GENISES)
- Use of technical data
- Data revision/change control
- Record submittals

2.2 Technical Areas

The audit included a technical evaluation of the adequacy and effectiveness of the TDMS processes and use of data activities. Details of the technical evaluation are documented in Section 5.4 of this report.

3.0 AUDIT TEAM AND OBSERVERS

Name/Title/Organization

Kenneth O. Gilkerson, Audit Team Leader, Office of Quality Assurance (OQA)
Robert P. Hasson, Auditor, OQA
James Blaylock, Auditor, OQA
Jefferson McCleary, Technical Specialist, Woodward- Clyde Federal Services

There were two observers present at the audit:

Ted Carter, U.S. Nuclear Regulatory Commission, Washington, D.C.
Latif Hamdan, U.S. Nuclear Regulatory Commission, Washington, D.C.

4.0 AUDIT MEETINGS AND PERSONNEL CONTACTED

A pre-audit meeting was conducted at the CRWMS M&O Offices, Las Vegas, Nevada, on September 28, 1998. Daily debriefings were held, to apprise the CRWMS M&O management and staff, of the progress of the audit and of any identified conditions adverse to quality. A post-audit meeting was conducted at the CRWMS M&O Offices, Las Vegas, Nevada, on October 7, 1998.

Personnel contacted during the audit, including those that attended pre-audit and post-audit meetings, are listed in Attachment 1.

5.0 SUMMARY OF RESULTS

5.1 Program Effectiveness

With the exception of those areas where conditions adverse to quality were identified previously in Audit M&O-ARP-98-16, the audit team concluded that critical process steps applicable to the TDMS processes including the Automated Technical Data Tracking (ATDT) and SEP databases were effectively implemented. However, the processes relating to data traceability and the use of data in Technical Reports and deliverables were determined to be unsatisfactory as detailed in Section 5.4 of this report.

5.2 Stop Work or Immediate Corrective Actions Taken

There were no Stop Work Orders or immediate corrective actions taken as a result of the audit.

5.3 QA Program Activities

A summary table of audit results is provided in Attachment 2. Details of the audit, including the objective evidence reviewed, are documented in the audit checklist. The checklist is maintained as a QA record.

5.4 Technical Audit Activities

While the focus of the audit was the traceability of data, issues relative to timeliness in submitting data and revised data into the TDMS as well as the use of the TDMS were examined initially in the audit process. This portion of the audit was primarily administrative in nature, although technical activities were involved.

Relative to the concern of data that had been assigned a DTN, but had not been captured in the GENISES databases (i.e., SEP, Reference Information Base [RIB]), the following was determined. In the past, much of the data generated by the laboratories and USGS were not in a format suitable to be submitted to these TDMS databases (i.e., geological maps, microfilm, videos). Approximately 2500 Document Transmittal Notices (DTN) have been assigned for which data in the TDMS databases does not seem to exist. While the data had a DTN number and was captured by reference in the ATDT, data was submitted only to records. Other DTNs referred to volumes of materials (i.e., Scientific Notebooks). In either case there was no link in the TDMS for actually pulling up the subject data for review or use; and the system had a statement “no link at this time.” This statement was misleading and led many to believe the associated data did not exist or was awaiting issuance to the TDMS. Subsequent to audit M&O-ARP-98-16, the TDMS has started removing the “no link at this time” statement and adding a

reference to the accession number to find the data/information in the records system. Further review disclosed that many of the 2500 DTNs were superceded and through the references on the Technical Data Information Form (TDIF) one could eventually get to the data in the TDMS databases. Also, some of the older DTNs can now be submitted to the TDMS due to recent enhancements in the software technology. A recommendation was made to the CRWMS M&O relative to deleting the superceded DTNs, and developing a schedule for the laboratories and USGS for resubmitting data necessary for VA and Licensing Application (LA) to the TDMS. It was noted in the previous audit that procedure YAP-SIII.3Q, Revision 2, *Processing of Technical Data on the Yucca Mountain Site Characterization Project*, currently has no time constraints for submitting data and a need to revise this procedure was re-emphasized. See Recommendation #1 in Section 6.0

Another concern dealt with the untimeliness of submitting data that was rejected by TDMS and required a revised submittal. The concerns cited in the previous audit were examined and follow-up with the laboratories in question determined that the information has subsequently been submitted. Again the previous audit recommendation for revising the YAP-SIII.3Q should resolve this issue relative to timeliness.

Upon evaluation of the actual use of the TDMS, it was determined that few people on the project actually access it. The TDMS manager estimated that the system was queried as few as ten times in a day. It has been pointed out that the Design and Science organizations have routinely bypassed the TDMS in obtaining data for their activities by going direct to the data source or to records. A project mandate is forthcoming stipulating that all data used in the development of product/ deliverables be obtained from the TDMS. As a result, the audit team recommends that all project personnel expected to provide data into the TDMS or use data from the TDMS undergo the orientation/training that the TDMS has made available to the project. For the TDMS to be effective and meet project needs, the cognizant personnel must first understand its capabilities and use it to identify any areas necessary for improvement. It is recognized that as technology advances, this system will always be in a state of change to facilitate its services to the user. See recommendation number two in Section 6.0.

Specifically, the audit team addressed whether data and related conclusions presented in technical reports could be traced back to supporting data contained in the TDMS. The audit team identified two major concerns relative to data traceability. First, in a number of cases the DTNs provided in technical reports as reference to source data were incorrect. Second, it was often not possible to locate source data from the information (DTNs or other references) provided in the reports. In addition to these major concerns, the audit team noted that even when the correct supporting data could be located, it was generally necessary to

perform some calculations or other manipulations on the supporting data in order to determine if it was in agreement with the data in the report. These manipulations were generally not described in the report, and were therefore left to the reader to interpret.

This audit was a follow on to M&O-ARP-98-16; which identified five probable disconnects between data in the SEP database and data in technical reports, and two probable disconnects between data in the RIB and data in technical reports. The first audit activities, therefore, were to evaluate these disconnects. The results of this evaluation confirmed the disconnects between the data in the technical reports and data in the TDMS [RIB and SEP] in all seven cases. The audit team expanded its evaluation in an effort to ensure that one or more reports were examined from each of the four national laboratories, the USGS, and the CRWMS M&O. The results of this expanded evaluation indicated that data traceability is a concern at all locations. It should be emphasized that the audit team relied on the TDMS to determine data traceability. *The Quality Assurance Requirements and Description (QARD)* document, Section III.2.3, requires that data traceability be maintained, but does not specify a mechanism by which this is to occur. The project has made the administrative decision that the mechanism will be the TDMS, and that by March 1999 all data used in quality affecting activities will come from the TDMS. This was the rationale for the audit team focusing on the TDMS, rather than investigating to see if the data were traceable in some other manner.

The audit team concluded that the primary reason that data traceability from technical reports back to supporting data and documentation is due to poor preparation and lack of rigor in the report preparation and review process. See CAR LVMO-99-C-001 in Section 5.5.1.

In all, the audit team examined nine reports and specific observations relative to each report are presented below. However, it should be kept in mind that in order for a definitive conclusion to be reached (the data in the TDMS does or does not support the report being examined), several conditions had to exist. These conditions are: 1) there had to be data in the report; 2) there had to be data in the TDMS that was clearly related to the report (same dates, same location [G-2], same type of data [pump test], etc.); and 3) the data in the two locations (report and TDMS) had to be presented in formats that were similar enough that it was possible to make a comparison (usually by performing some simple calculations on one data set or the other). In many instances these conditions did not exist and no evaluation was possible. In these cases the audit team attempted to evaluate data in other sections of the report, and/or data in other reports from the same organization. Though the sample size is small, the audit team believes the results are representative of recently developed technical reports. Deficiencies identified in each report have been included in CAR LVMO-99-C-001. Observations by

report are as follows:

Report 1

SPY148M4, *Single Heater Test Final Report*, (SNL)

Tables in Appendix C were examined. These tables present (among other data) the x, y, z locations of gauges in the Single heater Test (SHT) block. While the report identifies a SNL DTN (SNF35110695001.009), it was not in the TDMS. Data found in the Records Processing Center (RPC) for the *Single Heater Test, First Quarter Results* (SNF35110695001.003) disclosed discrepancies in the locations of some gauges relative to Appendix C tables in the report. Discussions with LLNL and additional record checks indicated that the locations of many LLNL RTDs and Temp Gauges shown in the SNL report were not consistent with LLNL documents (LL970505504244.043). The SNL report did not reference any LLNL DTNs or TDIFs for the source of LLNL gauge locations. Though the introduction to Appendix C did include a “disclaimer” relative to LLNL supplied data, it was non-specific, resulting in the Q-status of gauge locations supplied to SNL by LLNL being indeterminate. These results indicate that the report authors did not maintain traceability of data to associated documentation, or to the Q-status of the data. The report review was apparently not detailed enough to identify the discrepancies in gauge locations between the TDMS and the report, or to discover that the Q-status of some data was not clearly traceable.

Report 2

SLX0M3, *TSPA-VA Technical Basis Document, Unsaturated Zone Hydrology Model*, (SNL)

Table 2-34 was examined. The table provides minimum, mean, and maximum “alpha” and “k” values for model layers and references DTNs SNT05091597001.003, LB970601233129.001, and LB971100001254.004. The SNL DTN entry in the TDMS does contain most of the minimum and maximum “alpha” values. However, the report contains values for model layers that do not exist on the SNL DTN, and the report inverts the Calico Hills chz (zeolitic) and chv (vitric) values/layers relative to the SNL DTN. Values for minimum and maximum “k” (permeability) referenced to the SNL DTN do not exist on that DTN. Mean values of “alpha” and “k” are referenced to the LBNL DTNs. These DTNs are large model warehouse or system performance entries that could not be accessed for comparison. In addition to these discrepancies, Table 2-34 footnotes are confusing in that footnote 1 indicates that mean “alpha” and “k” values were supplied by LBNL, while footnote 2 indicates that the mean “k” values were supplied by SNL. In contrast, the footnote superscripting at the top of the table indicates that all minimum and maximum values came from SNL and all mean values came from LBNL. The audit team notes that in addition to data traceability not being maintained during the report preparation and review process, this

process also failed to detect the inversion of the Calico Hills zeolitic and vitric values/layers relative to the source DTN. The possible technical impact of this inversion should be investigated, see Recommendation #3 in Section 6.0.

Report 3

SPG32M3, *Administrative Report: Integrated Fracture Data in Support of Process Models, Yucca Mountain, Nevada*, (USGS)

Table B of the report provides DTNs and associated titles that are apparently applicable to the subject of the report, but no specifics as to which DTNs support which report sections. Despite several attempts, it was not possible to specifically relate data in the TDMS to data in report. The audit team notes that with additional effort, utilizing resources other than the TDMS, it may have been possible to establish data traceability. However, the focus of the audit was on evaluating traceability utilizing the TDMS, and the report preparation and review process did not maintain transparent traceability using that mechanism.

Report 4

SP23PM3, *Results of Hydraulic and Conservative Tracer Tests in Miocene Tuffaceous Rocks at the C-Hole Complex, 1995 to 1997, Yucca Mountain, Nye County, Nevada*, (USGS)

Table B provides a list of DTNs and associated titles used in the report. These are apparently appropriate to the report topic, but specific DTNs are not referenced to specific report sections. Based on similarities in titles and dates, it was possible to associate DTN GS970308312314.002 (Water-level altitude data from four wells in the continuous network, May through December 1996) with Figure 26 of the report (Drawdown in UE-25 ONC-1, UE-25 WT#3, USW H-4, and UE-25 WT#14, May 8, 1996, to March 26, 1997). By performing a series of calculations on the data in the TDMS (correlating dates of measurement to time in minutes since the start of pumping, and calculating differences in water-level altitudes between start dates and dates of measurement) it was possible to confirm that selected points on Figure 26 were supported by data in the TDMS.

Chemical data on Table 11 were checked against data on DTN GS970708312314.004 (also selected based on similarities in title and date), and the data in the TDMS were found to support the report table.

The audit team noted that while data traceability was established for parts of Figure 26 and Table 11 of this report, it was a time consuming and somewhat interpretive process. Traceability was not transparent. If the project's goal is transparent traceability then the reports should include a brief description of the steps required to go from the supporting data to the summarized data and/or conclusions stated in the report, see Recommendation #4 in Section 6.0.

Report 5

SP24CBM3, *Preliminary Saturated-Zone Flow Model*, (USGS)

Table B of the report lists DTNs and associated titles that are apparently appropriate to the topic of the report and the data provided on Table 1 of the report. However, despite several attempts, it was not possible to associate any specific Table 1 data entries with a specific data entry on a DTN.

In conjunction with this deliverable, two TDIFs were submitted on C-Hole complex pump tests, TDIF 305143 on the 280 GPM pump test, and TDIF 305142 on the 356 GPM pump test. When DTNs for these TDIFs were obtained from the TDMS, they were obviously data from the pump tests. However, differences in titles/parameters (pump test Vs pneumatic pressure), format, and units, precluded evaluation by the audit team. The audit team noted that it is possible to search the TDMS using several methods including DTNs, author name, and key words (parameter names). It appears that parameter names applied to DTNs and/or TDIFs can be misleading in some cases. The C-Hole testing is designed to test various properties of the saturated zone, yet the parameter name associated with these pump tests was “pneumatic pressure”. While it may be (depending on how the holes were instrumented) that pneumatic pressure was measured at the wellhead, it is a term more typically associated with the unsaturated zone. Adding other parameter names such as “pump test” or “saturated zone testing” would make the data more accessible to potential users, see Recommendation #5 in Section 6.0

Report 6

SP24BM3, *The Site Scale Unsaturated Zone Model of Yucca Mountain, Nevada, for the Viability Assessment*, dated June 1997 (LBNL)

Figure 10.4-1 of the report shows pneumatic pressure data from borehole NRG-7a. Based on Table 10.3-1, this information came from DTN GS960308312232.001. When this DTN was obtained from the TDMS, it was found that there was no overlap in dates. Therefore, the data on the figure came from some other source.

Table 11.3 of the report provides thermal conductivity data (misabeled as thermal conditions) and references the RIB. When the RIB entry was pulled from the TDMS it was found that three values (of the five presented in the report) matched. The other two apparently came from another (unidentified) source.

Figure 11.3 of the report provides a plot of temperature Vs depth for borehole SD-12, and compares observed and calculated data. Based on Table 11.2, the observed temperature data came from DTN GS960308312232.001. While the temperature data on the report figure is plotted as a single line, the TDMS entry

provides tabular data collected over a period of several months (therefore a range of temperatures was recorded at each depth of measurement). When the temperature ranges from the DTN in the TDMS were plotted by the audit team on figure 11.3 of the report, it was found that they did not match (fell to the left of) the temperature profile on the figure. Figure 11.11 appears to use the same temperature profile.

Table 13.3.2 of the report provides data on chloride concentration in pore and perched water from Yang et al. 1996. Based on table 13.2.1, the DTN associated with this reference is GS961108312271.006. This DTN does not appear to exist in the TDMS. The audit team did a search on author name but was unable to locate the supporting data.

Figure 13.6.5.3 of the report provided data on a pump test at G-2, Table 13.2.1 indicates that this data came from DTN GS960508312312.006. When this DTN was obtained from the TDMS it was found to contain only a few days of data rather than the 250 days of data shown on the figure. The audit team did a search on the author and was able to locate the correct DTN (GS970208312312.003) which did support the report figure.

The audit team has several comments relative to this report. First, the fact that this report contained more errors than any other report evaluated, is in part a reflection of better referencing to DTNs. It was relatively easy for the audit team to associate data presented in the report with the DTNs that were supposed to support that data. Second, it was very clear that the report preparation and review process was ineffective. In particular, reviewers did not ensure that the data referenced in the report supported the data summaries and conclusions presented in the report, as evidenced by the errors identified during the audit. The technical adequacy of the report is therefore questionable. Third, in response to questions from the audit team, LBNL supplied explanatory information as to how some data were derived (developed). Since this information was not presented in the report, traceability was not transparent, again see Recommendation #4 in Section 6.0. Finally, in at least one case (relative to Figures 11.3 and 11.11) in addition to errors, information provided by LBNL in response to questions from the audit team, indicates that not all available data were used in the preparation of the figures. The potential technical impact of the errors and the omission of available data should be evaluated, again see Recommendation #3.

Report 7

SP3000M3, *Near-Field and Altered-Zone Environment Report, Volume 1: Technical Basis for EBS Design, Revision 1* (LLNL)

On page 95 of the report, DTN LL960201004241.011 is cited and reference is made to Table 10.4-4. This table (as is clear from the referencing) appears on

page 10.4-94 of another previous but related deliverable (MOL305). When the DTN was obtained from the TDMS, it was found that the data in the TDMS did not match the data in the report. While all the data were from the same area (natural analog studies at the Wairakei geothermal field) the report presented more information both in duration and in number of parameters reported. By matching temperature data, it appears that the last seven entries of the TDMS data correspond to the first seven entries of the table in the report. However, the saturation index data [$\log (Q/K_{eq})$] do not match exactly, and the precipitation rate data [$\text{mol/m}^2/\text{d}$] do not match at all, perhaps because somewhat different units appear to be used in the report.

Discussions with LLNL personnel indicated that the data in the report provided newer and more complete information that had not yet been submitted to the TDMS. The audit team notes that the “newer” information was included in a report previous to the one initially examined during the audit, which raises the concern of timeliness of data submittal to the TDMS, see Recommendation #6 in Section 6.0. As has been noted before, the citation of the incorrect DTN indicates lack of rigor in the report preparation and review process. In addition, the mismatch in the saturation index data and the possible mismatch in the precipitation rate data should be evaluated for technical impact on report results, again see recommendation three.

Report 8

SP25BM3, *The Site-Scale Unsaturated Zone Transport Model of Yucca Mountain, Revision 1* (LANL)

Figure 6-2 of the report presents information on Chlorine-36/ total Chloride ratios in infiltrating water. A table in the report provides a listing of applicable DTNs by category, but does not provide titles for the DTNs. In the category of Chlorine-36 studies, the table provided 34 DTNs. The audit team sampled five DTNs that were apparently not directly applicable to infiltrating water before concluding that this tact was too time consuming. The team then did a search by author and located a few titles that appeared to be potentially applicable. These were obtained from the TDMS, but no data directly applicable to Figure 6-2 could be located. The audit team noted that there is no consistency among project participants in terms of how data in reports are referenced to supporting data identified by DTN. The method used in this report (a simple listing of DTNs by category) was the least useful method encountered. It does not “facilitate” (QARD Section III.2.3) the traceability of the data to associated documentation or to its Q-status, see Recommendation #7 in Section 6.0

Report 9

Special Studies, *The Technical Site Suitability Synthesis Report (Site Description*

Document), Section 4, CRWMS M&O

Section 4.1.3 of the Site Description Document discussed Regional and Site Climatology, and section 4.1.3.1 provides data sources. Section 4.1.4 discussed the Meteorological Monitoring Network. Data is presented in a series of summary tables (4.1-11 through 4.1-20). The Site Description Document does not provide DTNs for the data in the summary tables so the document that was referenced in section 4.1.3.1 was obtained (Engineering Design Climatology and Regional Meteorological Conditions Report, B00000000-01717-5707-00066 REV00). This report is clearly the correct source for the summary tables presented in the Site Description Document; however, there is no link to the DTNs that would have provided the source data for the summary tables. The audit team would like to again remind the reader of the typical nature of this audit and the focus on the administrative decision to provide traceability via the TDMS and DTNs. A more extensive records search may have located the supporting data for the summary tables. However, traceability through the TDMS was not provided in the report.

In summary, the audit team observed problems in data traceability from data and conclusions presented in technical reports back to supporting data via the TDMS with all participants evaluated (LLNL, LBNL, LANL, SNL, USGS, and CRWMS M&O). These problems included: 1) not being able to find the supporting data; 2) discovering that incorrect DTNs were cited, though the correct data were used in the reports; and 3) discovering that there were errors/discrepancies in the reports relative to the supporting data. In spite of the small sample size, problems of one type or another were common, and the results of the audit teams evaluation are believed to be representative of technical reports being developed by the project. In addition to the identified CAR (LVMO-99-C-001), the audit team has developed a number of recommendations that are presented in Section 6.0 of this report.

5.5 Summary of Conditions Adverse to Quality

The audit team identified one condition adverse to quality during the audit. This is described in Section 5.5.1 of this report as CAR LVMO-99-C-001.

5.5.1 Corrective Action Requests

CAR LVMO-99-C-001

CAR LVMO-99-C-001 was issued to identify that due to a lack of rigor by the originating organization(s) in the report preparation and subsequent technical reviews, the Technical Reports supporting the OCRWM VA were not accurate. Specifically, traceability of data used or referenced in Technical Reports from the data source(s) are not maintained.

5.5.2 Deficiency Reports

None

5.5.3 Performance Reports

None.

5.5.4 Conditions Adverse to Quality Corrected During the Audit

None

6.0 RECOMMENDATIONS

The following recommendations resulted from the audit and are presented for CRWMS M&O management consideration:

1. The TDMS manager indicated in the previous audit that there were approximately 2500 DTNs that specified “no link at this time”; that is, one could not get to the data associated with that DTN through the TDMS. As discussed in Section 5.4, it was found, however, that the data exists in records and that the “no link at this time” statement in the TDMS databases was misleading. Additionally, it was found that many of the 2500 DTNs with no data in the TDMS were superceded numbers. A recommendation was made to the CRWMS M&O relative to deleting the superceded DTNs, referencing the record assession numbers in the database (pointing to where the data actually resides), and developing a schedule for the laboratories and USGS to resubmit data necessary to support VA to the TDMS databases that is not currently captured there. It was noted in the previous audit that the procedure YAP-SIII.3Q currently has no time constraints for submitting data and a need to revise this procedure was re-emphasized. See the comments on previous recommendations at the end of this section.
2. The project has made the administrative decision that the mechanism for obtaining data will be the TDMS, and that by March 1999 all data used in quality affecting activities will come from the TDMS. The audit team recommends that all project personnel expected to provide data into the TDMS or use data from the TDMS undergo the orientation/training that TDMS has made available to the project.
3. In three cases the audit team discovered errors/discrepancies between data in the TDMS and data/conclusions presented in technical reports that have the potential to impact the technical results presented (see the discussion in section 5.4 relative to reports 2, 6, and 7 from SNL, LBNL, and LLNL, respectively). In addition to

evaluating these specific concerns, and in view of the likelihood that other similar errors/discrepancies may exist in these and other reports, the CRWMS M&O should develop a plan and priorities for evaluating reports that are important to licensing. See also CAR LVMO-99-C-001.

4. If a goal of the project is to make the traceability of data and conclusions presented in reports back to supporting data transparent, then the reports must include more explanatory information in terms of how the supporting data was manipulated. For example, when a single line plot of a parameter Vs time or depth is supported by a large tabular data set in the TDMS that contains a range of values for the measured parameter, it is clear that some sort of averaging or selection process was used to get the single line plot. The audit team did not encounter any cases where the averaging or selection process was explained; though in some cases they were able to discern what must have been done. Guidance should be provided to report authors and reviewers relative to improving the ease or transparency of data traceability.
5. In one case, the audit team found the parameter name for data in the TDMS to be misleading. Pump test data from saturated zone testing at the C-Hole complex was listed only under “pneumatic pressure,” a term more typically associated with the unsaturated zone. Previous audit M&O-ARP-98-16 noted that parameter names in reports, “Thermal Capacity” for example, may be different than the parameter name in the TDMS, “Heat Capacity” in this case. The audit team also recognizes that parameter searches that provide too many or too few “hits” are not particularly useful, and finding an appropriate balance is a difficult task. Regardless, there appears to be a need for both better accuracy and better consistency in the use of parameter names in reports and in the TDMS.
6. During the course of the audit, when disconnects between the reports being evaluated and the TDMS were identified, the audit team typically contacted the authoring organization for information regarding how or why the disconnect occurred. In several cases the lack of timeliness in submitting data to the TDMS was the factor or a contributing factor for the disconnect. It is recommended that time frames be established for the submittal of data to the TDMS. See Recommendation #1.
7. Of the various technical reports examined during the audit, in only one case were the DTNs associated with the data in the report, actually provided with the data. This was for Table 2-34 of the SNL TSPA-VA Technical Basis Document (Report 2). This is clearly the best method of linking the reports to the supporting data. The system used by LBNL made it fairly easy for the audit team to identify supporting data, but some interpretation was still involved. The direct link, at the point of use, is unequivocal and should be the method used. The audit team is

aware that report authors have recently been given direction to use this method and at this point would like to concur with that direction.

Previous Recommendations:

Since this audit was a follow-up to M&O-APR-98-16, the audit team offers the following comments relative to the recommendations made as a result of that audit.

Regarding previous Recommendation #1, the need to revise YAP-SIII.3Q is appropriate. In particular, the current audit also identified the concerns of timeliness of data submittal to the TDMS, and the need to more firmly link data or conclusions provided in technical reports to supporting DTNs.

Relative to previous Recommendation #2 on providing more links to the records system, the audit team strongly concurs with this recommendation. Current practice simply lists related assession numbers at the bottom of the ATDT entry. The user has no way of knowing what an assession number may contain without pulling the file for display. There are sometimes extensive assession number lists and, after going through the time consuming process of looking at all of them, a user may have only seen surrogate records stating that floppy disks are in the records center. Simply annotating the current assession numbers list would be helpful. Adding links via assession numbers to supporting records such as scientific notebooks, and technical reviews would be extremely useful in verifying the qualification status of data that is needed to address CAR LVMO-98-C-002.

Relative to previous Recommendation #3, this recommendation was essentially restated herein as Recommendation #7. Source DTNs should be provided at the point of use in technical reports.

7.0 LIST OF ATTACHMENTS

Attachment 1: Personnel Contacted During the Audit

Attachment 2: Summary Table of Audit Results

ATTACHMENT 1
PERSONNEL CONTACTED DURING THE AUDIT

<u>Name</u>	<u>Organization/Title</u>	<u>Pre-Audit Meeting</u>	<u>Contacted During Audit</u>	<u>Post-Audit Meeting</u>
Aden-Gleason, N.	LBNL/Engineering Assurance	X		X
Arth, F.	M&O/Surface Facilities Organization			X
Belke, W.	U.S. Nuclear Regulatory Commission	X		
Berlien, R.	Repository & Licensing, Engineering Assurance			X
Bodnar, S.	M&O/Manager, Technical Data	X	X	X
Bodvarsson, G.	LBNL, Laboratory Lead		X	X
Brees, Dan	M&O, Environmental Programs		X	
Bryan, Barbara	LLNL, Technical Data Coordinator	X	X	
Burningham, A	M&O/Technical Assurance Liaison	X	X	X
Calloway, D.	M&O/Manager, Configuration Management	X	X	X
Clark, J.K.	M&O/Deputy Assistant General Manager		X	X
Clark, John	M&O/Waste Management & Integration			X
Clark, R.	Acting Director, Office of Quality Assurance		X	X
Clarke, W.	LLNL, Laboratory Lead			X
Coatsworth, M	LLNL, Technical Data Coordinator		X	X
Craig, Robert	USGS, Technical Project Officer	X	X	X
Dana, Steve	OQA/QATSS			X
Daneels, J.	SNL, Department Manager	X	X	X
Fogdall, S.	M&O/Manager, PIM		X	X
Friend, J.	LANL OQA Lab Representative	X		X
Gardiner, J.	DOE/ Engineer			X
Grant, T.	M&O/NEPO	X	X	X
Greene, H.	OQA/QATSS	X		X
Harris, M.	M&O/Project Support			X
Harris, S.	LBNL OQA Lab Representative	X	X	X
Hayes, L.	M&O/Manager, NEPO	X	X	X
Hirons, T.	LANL Laboratory Lead	X		X
Howarth, S.	SNL/Performance Assessment			X
Hudson, W.	QATSS Project Manager			X
James, Eloise	SNL/Technical Data Coordinator		X	
Jones, Phil	M&O/TDMS		X	
Keele, R.	M&O/Support Specialist			X
Lentz, F.H.	OQA/QATSS Engineering Support		X	X
Link, S.	LBNL/ Technical Data Coordinator		X	
Lugo, C.	M&O/ Assistant Manager, NEPO	X	X	X
Lugo, M.	M&O/NEPO			X
Marler, R.	M&O/Manager Support Operations	X	X	X
Martinez, C.	LANL Technical Assurance Liaison	X		X

McDaniel, M.	OQA/QATSS Programs			X
McKinley, P.	USGS Technical Data Coordinator		X	
Morgan, R.	M&O/Repository & Licensing			X
Opelski, E.	OQA/QATSS Internal Audit Lead	X	X	X
Orrell, A.	SNL/Laboratory Lead	X	X	X
Palmer, C.	M&O/LLNL			X
Palay, C.	M&O/NEPO		X	
Pelletier, J.	LLNL OQA Lab Representative	X	X	X
Quittmeyer, R.	M&O/NEPO		X	
Robertson, L.	M&O/Manager, Planning & Licensing	X	X	X
Rochester, V.	MTS/ DOE Support			X
Spence, D.	M&O/TDMS	X	X	X
Taylor, Ron	SNL/Field Technician		X	
Warren, C.	OQA/QATSS Verification Manager			X
Warriner, D.	DOE/YMSCO			X
Wilkins, D.	M&O/ Assistant General Manager, Las Vegas	X	X	X
Younkers, J.	M&O/Performance Assessment Manager		X	X
Young, J.	LANL Technical Data Coordinator	X	X	X
Zimmerman, R	M&O/Product Control Group			X

Legend:

ATDT	Automated Technical Data Tracking
NEPO	Natural Environmental Programs Operation
OQA	Office of Quality Assurance
QATSS	Quality Assurance Support Services
MTS	Management Technical Support
PIM	Performance Information Management

ATTACHMENT 2
SUMMARY TABLE OF AUDIT RESULTS

TECHNICAL DATA SUBMITTAL & USE

Process Steps	Details (Checklist)	Deficiencies	Recommendations	Process Effectiveness	Overall
Data Identification & Controls	p.1, item 1 p.2, item 2		Rec. #1, 2	SAT	SAT
Data review & submittal	p.3,item 3, 4		Rec. #1, 5, 6	SAT	SAT
Data traceability	p.1, item 1, 10	LVMO-99-C-001		UNSAT	UNSAT
Data Input into GENISES	p.3,item 3		Rec. #1, 5, 6	SAT	SAT
Use of Technical Data In Technical Reports	p.1, item1, 6-11	LVMO-99-C-001	Rec. #3, 4-7	UNSAT	UNSAT
Data revision/change control	p.3, item 5		Rec. #1, 6	SAT	SAT
Record submittals	p.1, item 1, 11			SAT	SAT

TDMS PROCESS (Overall implementation)		SAT
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LEGEND:

SAT.....Satisfactory

UNSAT.....Unsatisfactory